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US 3582489 A

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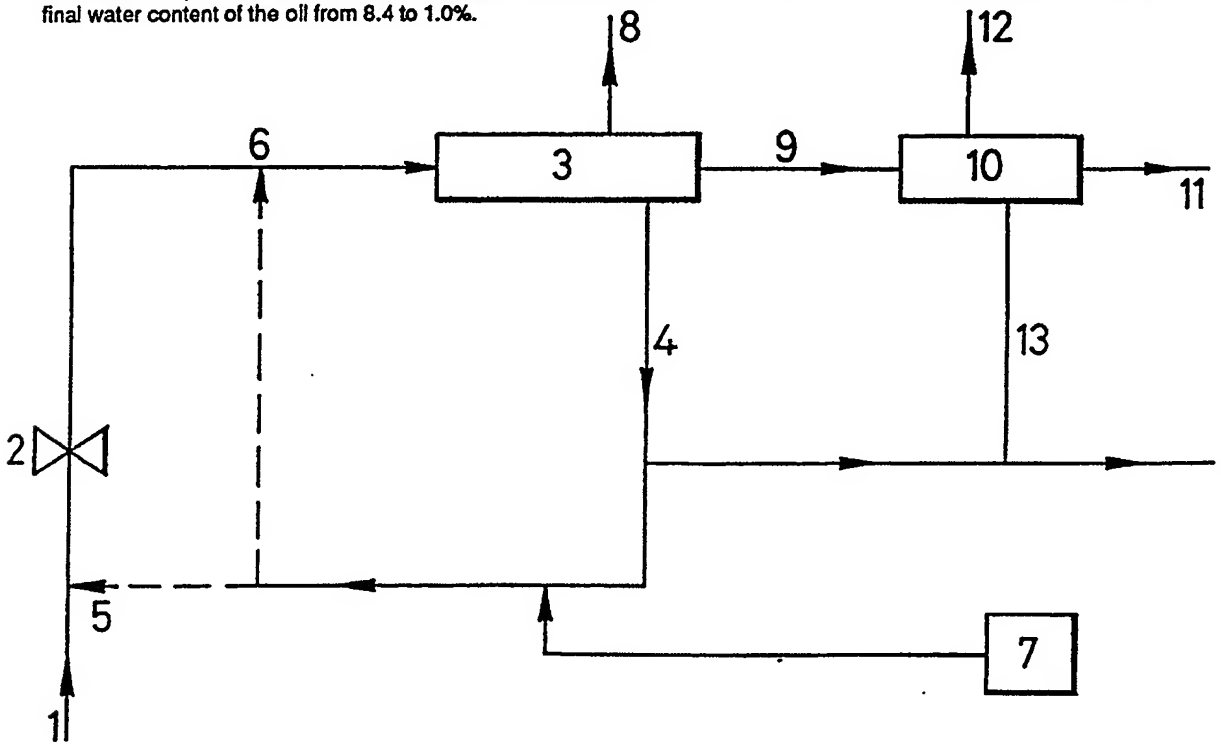
(54) Method for separating production fluids

(57) A method for separating a production fluid obtained from an oil well into separate components by means of at least one separator 3 comprises adding water 4 to the production fluid before passage to the separator in an amount sufficient to raise water content of said production fluid to a level where the tendency for the formation of a stable water-in-oil emulsion is reduced. As shown the water which is added is partly obtained from the first separator 3, which is a hydrocyclone, and partly from a supply 7, and may be added to the fluid from well 1 upstream or downstream of pressure control valve 2. Gas is discharged from hydrocyclone 3 at outlet 8 and relatively pure oil 9 is fed to a second stage electrostatic separator 10. A demulsifier may also be added. In an example, increasing the initial water content from 10 to 60% causes a reduction in the final water content of the oil from 8.4 to 1.0%.



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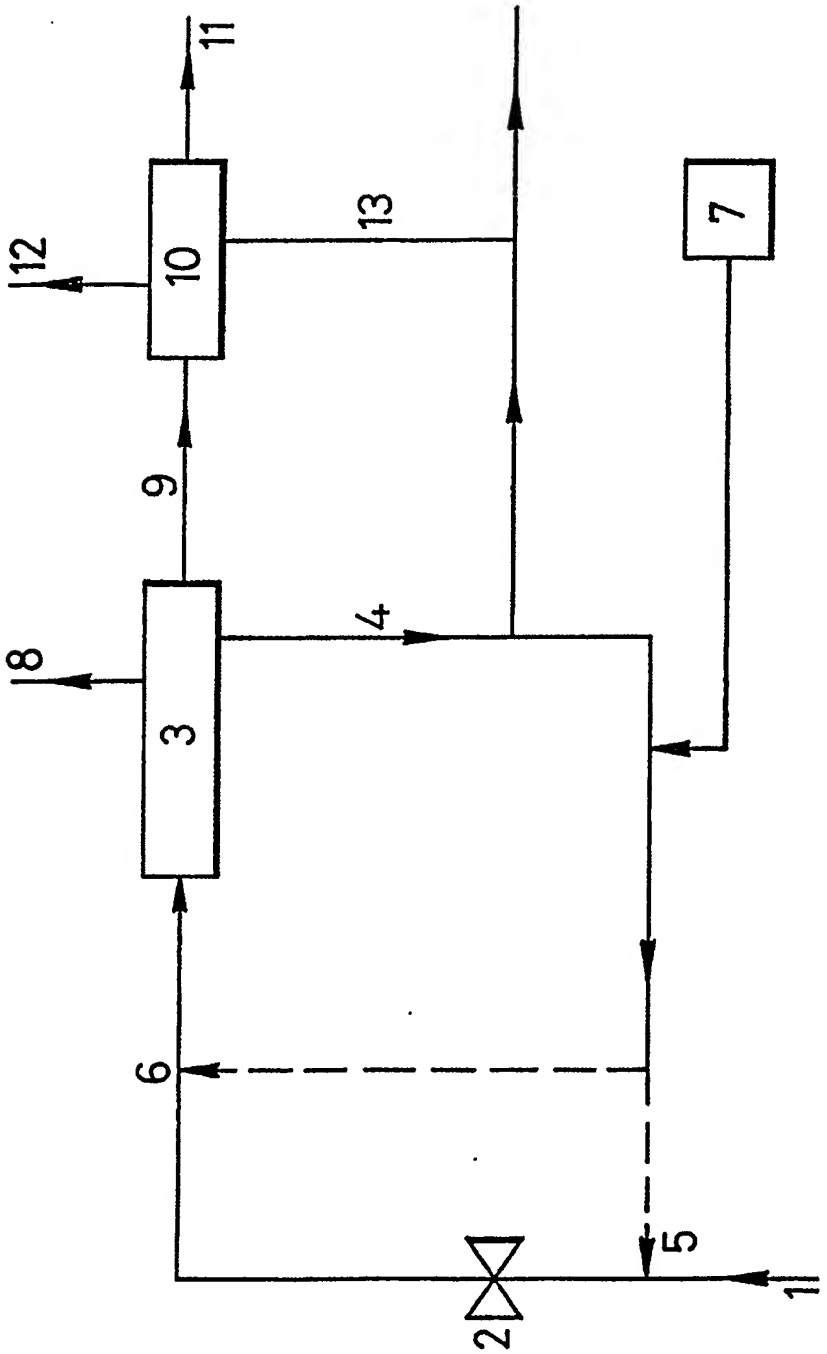
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METHOD FOR SEPARATING PRODUCTION FLUIDS

This invention relates to a method of separating production fluids, in particular to a method of separating oil, water and gas from hydrocarbon containing fluids produced from an underground reservoir.

Fluids obtained from a production well in contact with an underground hydrocarbon bearing reservoir must be separated into the components of oil, water and gas in order to be transported from the production facility, recycled or for disposal purposes.

At production facilities located onshore the separation equipment required may easily be accommodated. However when production facilities are required on an offshore platform the process equipment necessary for separation has a more limited space availability.

Further the pressure control valve or choke valve situated at the wellhead may cause intense mixing of the produced fluids which may lead to the formation of stable water-in-oil emulsions. For subsequent separation on the platform such emulsions require a series of both gravity and electrostatic separators.

The temperature at which the produced fluids enter the separator facilities is known to affect separation. GB 2233577-A describes a method for separating oil well production fluids by adjusting the temperature of the fluids before separation by means of recycling with heating a portion of the separated water.

We have now found that by increasing the ratio of water to oil in the produced fluids to a level at which the tendency for stable

water-in-oil emulsions to form is reduced, separator residence times and hence separator size can be reduced with resultant space and weight saving.

Thus according to the present invention there is provided a method for separating a production fluid obtained from a production well into separate components by means of at least one separator comprising adding water to the production fluid before passage to the or first separator in an amount sufficient to raise the ratio of water to oil in said production fluid to a level whereby the tendency for the formation of a stable water-in-oil emulsion is reduced.

The water may be added to the production fluid either upstream or downstream of the choke valve.

If required demulsifiers may be added either upstream or downstream of the choke valve. They may also be added upstream of the separators to assist in dehydration.

The water may be a recycled portion of the produced water from the separator or alternatively may additionally contain water from a separate source.

The percentage of water present in the fluids before passage to the first separator is in the range 10-95% preferably in the range 50-90% (wt or vol).

The fluids entering the or first stage separator may suitably be at the natural temperature of the produced fluids.

The method of the present invention is suitable for use in the separation of production fluids containing oil, gas, water and other components, for example, sand.

The method is particularly directed to production fluids which contain viscous, heavy crude oils.

By reducing the formation of stable water-in-oil emulsions in the production fluids passing to the or first stage separator, most of the water present easily separates out and can be removed.

Residence times may therefore be very short and may be in the region of 5-10 secs. Suitable separators for the first stage are hydrocyclone separators.

The oil phase leaving this separator therefore has a lower water level compared to the production fluid leaving the reservoir. The oil may then be passed to a second stage separator which may be a conventional electrostatic separator which may also permit a shorter residence time.

This has the advantage of not requiring a series of gravity and/or electrostatic separators which are required for separation if the production fluids alone are used as the feed.

The size of the separator(s) may thereby be reduced with an associated weight and cost saving.

The method of the present invention is therefore particularly suitable for use in separating fluids produced from a production well on an offshore platform.

The first stage separator may be located if necessary on the sea bed to further enhance weight saving on the platform.

The preferred number of separators for use with the method of the present invention is two.

In certain circumstances efficient separation may be affected by use of a single separator.

The present invention is further illustrated with reference to the accompanying drawing which represents a flow diagram of a process according to the present invention and the following example.

With reference to the drawing, production fluid from a subsea production well flows via line (1) to a choke valve (2) and then to a hydrocyclone separator (3).

Recycled water (4) is added to the production fluid either upstream of the choke valve at (5) or downstream at (6).

The recycled water may additionally contain water from a separate source (7).

After passage through the separator (3) the production fluid is separated into gas (8), water, a portion of which may be recycled (4) and oil with a low water content (9).

The oil phase (9) is then passed to a secondary electrostatic separator (10) for further separation into oil (11) gas (12) and

water (13).

Example

A water-in-oil emulsion containing 10% by volume simulated produced water with a total salinity of 192 grams/litre and 90% Claire crude oil was prepared at 70°C using an air-driven blender operating at 4000 rpm. A chemical demulsifier, RP 6101, was added at 150 ppm and the emulsion pumped to a vertical oil/water separator at 70°C through which the fluid passed in plug flow. After 15 minutes, the residual water content in the emulsion had fallen to 8.4%.

When this procedure was repeated with the difference that produced water was recycled and blended into the emulsion stream to bring the initial water content to 60% of the total fluid volume prior to entry into the separator, the corresponding residual water content after 15 minutes residence time in the separator was 1.0%

Claims

1. A method for separating a production fluid obtained from a production well into separate components by means of at least one separator comprising adding water to the production fluid before passage to the or first separator in an amount sufficient to raise the ratio of water to oil in said production fluid to a level whereby the tendency for the formation of a stable water-in-oil emulsion is reduced.

2. A method according to claim 1 wherein a demulsifier is added.

3. A method according to either of the preceding claims wherein the water is a recycled portion of the produced water from the separator.

4. A method according to any of the preceding claims wherein the ratio of water to oil in the stream before passage to the separator is in the range 10-95% (wt or vol).

5. A method according to claim 4 wherein the ratio of water to oil in the stream before passage to the separator is in the range 50-90%.

6. A method according to any of the preceding claims wherein the first stage separator is a hydrocylone separator.

7. A method according to any of the preceding claims wherein the oil phase from the first stage separator is passed to a second stage separator.

8. A method according to claim 7 wherein the second stage separator is an electrostatic separator.

9. A method as hereinbefore described with reference to the

accompanying drawing.

atents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

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Relevant Technical fields

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(ii) Int Cl (Edition 5) B01D (17/02,17/025,17/04, 17/06); B03C (5/00,5/02) E21B 43/34

Search Examiner
R T HAINES

Databases (see over)
(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

Date of Search
13 OCTOBER 1992

Documents considered relevant following a search in respect of claims 1-9

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	US 3582489 (MEADOW) see column 4	1,2,4,7, 8

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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A: Document indicating technological background and/or state of the art.

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E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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